Time : 3 Hrs. **TEST - I** MM : 720

[PHYSICS]

Choose the correct answer :

1. Velocity of a particle moving in a straight line varies with time as $v = (3 + 2t)$ m/s. The displacement covered in first 3 second is
   (1) 24 m (2) 27 m
   (3) 18 m (4) 9 m

2. If the rate of change in velocity w.r.t time is constant and its position after 6^{th} second will be same as that after 11^{th} second then the particle returns to the starting point after
   (1) 13 s (2) 15 s
   (3) 17 s (4) 19 s

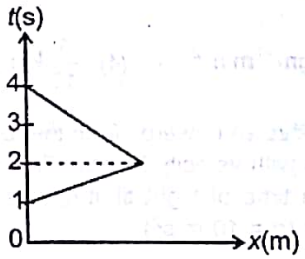
3. A particle moves in a straight line with velocity $v = (t - 2)^2$ m/s, where t is time, then the velocity of particle where acceleration is zero, is
   (1) 2 m/s (2) Zero
   (3) 4 m/s (4) –2 m/s

4. If v and a are the velocity and acceleration respectively for a body at an instant
   (a) when $v = 0$, a must be non-zero
   (b) when $v = 0$, a may be zero
   (c) when $a = 0$, v may be zero
   (d) when $a = 0$, v must be non-zero
   Choose the below correct possibility option
   (1) a & d
   (2) b & c
   (3) a & c
   (4) b & d

5. A bus moving with a constant speed on a straight road takes a turn at a curve with the same speed. The correct option is
   (1) Its velocity is not changed
   (2) Acceleration during turn is zero
   (3) Acceleration during turn must be constant
   (4) Its velocity is changed

6. A ball is projected upwards from the ground with an initial speed u. The ball is at a height of 160 m twice within the time interval of 4 s, then initial speed u is
   (1) 20 m/s
   (2) 40 m/s
   (3) 60 m/s
   (4) 80 m/s

7. Position (x) versus time (t) graph of a particle moving in a straight line is as shown in the figure. The velocity ratio of a particle at 1.5 s and 2.5 s is



   (1) $-\frac{3}{1}$ (2) $-\frac{2}{1}$
   (3) $\frac{2}{1}$ (4) $\frac{3}{1}$

Space for Rough Work

8. If $U = U_0 e^{-\alpha t^3 + \beta t}$, where U = energy, t = time, U_0 = constant energy, e is exponential function, then the dimensions of α are

(1) $[M^0L^0T^{-3}]$ (2) $[M^0L^0T^{-2}]$

(3) $[M^0LT^3]$ (4) $[M^0LT^2]$

9. The force acting on a particle at time t is given by the equation, $F = \frac{V_0}{\beta}\sin(\beta t^2)$, where V_0 and β are constants. The dimensions of V_0 and β are respectively

(1) $[M^1L^1T^2]$ & $[T^{-2}]$

(2) $[M^1L^1T^{-2}]$ & $[T^{-2}]$

(3) $[M^1L^1T^{-4}]$ & $[T^{-2}]$

(4) $[M^1L^1T^{-2}]$ & $[T^1]$

10. In a new system, unit of length is 6 m, unit of mass is 2 kg, unit of time is 2 minute. In the new system of units, unit of pressure is equal to

(1) 12 $kgm^{-1}min^{-2}$ (2) 24 $kgm^{-1}min^{-2}$

(3) $\frac{1}{24}kgm^{-1}min^{-2}$ (4) $\frac{1}{12}kgm^{-1}min^{-2}$

11. A body is thrown upwards from the roof of a building 35 m high with velocity 30 m/s. The average speed during the time of flight till it strikes the bottom of building is (g = 10 m/s^2)

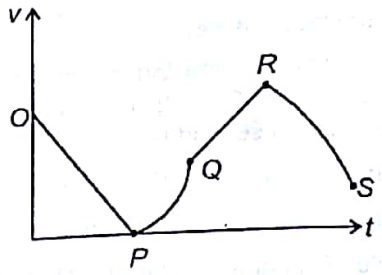
(1) 17.86 m/s

(2) 11.7 m/s

(3) 27.86 m/s

(4) 21.7 m/s

12. Velocity-time (v - t) graph of a particle moving in a straight line is as shown in the figure, the sign of acceleration in regions OP, PQ, QR and RS respectively are



(1) +, +, −, −

(2) −, −, +, +

(3) −, +, −, +

(4) −, +, +, −

13. In the equation $\int \frac{dv}{v^{3/2}} = BCe^{-2Ct}$, where v is velocity, t is time, e is exponent, the dimensions of B are

(1) $\left[L^{-\frac{1}{2}}T^{\frac{3}{2}}\right]$

(2) $\left[L^2T^{-\frac{3}{2}}\right]$

(3) $\left[L^{-\frac{1}{2}}T^{\frac{5}{2}}\right]$

(4) $\left[L^{-\frac{1}{2}}T^{-\frac{5}{2}}\right]$

14. In a relation $S = \frac{b}{b-c}$, where b, c, S are physical quantities, b is (5.0 ± 0.1) N and c is (2.0 ± 0.2) N then the percentage error in S is

(1) 12% (2) 2%

(3) 24% (4) 6%

Space for Rough Work

15. A particle is moving in a straight line whose position varies with time as $x = 8t^2 + \frac{2}{\pi}\sin \pi t$, where x is in meter and t is in second. Then the position, velocity and acceleration of a particle at $t = 4$ s respectively are

(1) 128 m, 66 m/s, 14 m/s^2

(2) 118 m, 66 m/s, 16 m/s^2

(3) 128 m, 66 m/s, 16 m/s^2

(4) 128 m, 44 m/s, 16 m/s^2

16. A balloon initially at rest, starts rising from the ground with an acceleration of 2 m/s^2. After 4 s, a stone is dropped from a balloon. In one second of time after drop, the stone will cover a distance of (g = 10 m/s^2)

(1) 3.0 m (2) 3.4 m

(3) 3.8 m (4) 2.6 m

17. If the force acting on a body of mass $(2\text{ kg} \pm 20\text{ g})$ is $(3\text{N} \pm 2\%)$, then maximum percentage error in acceleration is

(1) 6% (2) 12%

(3) 2% (4) 3%

18. If the mass of the earth increases by 80% and radius of the earth increases by 40% then the percentage change in acceleration due to gravity on the surface of earth is (where $g_s = \frac{GM}{R^2}$, M = mass of earth and R = radius of earth)

(1) Zero

(2) +8.16%

(3) –8.16%

(4) 160%

19. Which of the following quantity has a unit but no dimensions?

(1) Refractive index (2) Specific gravity

(3) Relative velocity (4) Angle

20. A particle is moving in a straight line with initial velocity u and uniform acceleration a. If the sum of distances travelled in 5th and 6th second is 60 m, then the velocity after 5 second is

(1) 30 m/s (2) 40 m/s

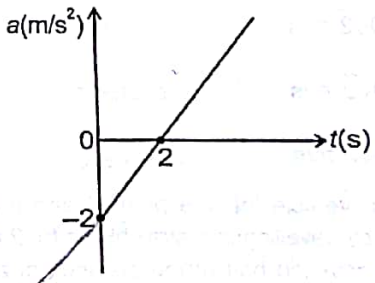
(3) 50 m/s (4) 20 m/s

21. Water drops fall at regular intervals from a roof at height of 125 m from the ground. At an instant when 11th drop is about to leave the roof and 1st drop is at a height of 45 m from the ground, at that instant the distance of 10th drop from the roof is (g = 10 m/s^2)

(1) 0.40 m (2) 0.20 m

(3) 0.80 m (4) 1.2 m

22. If a particle is moving in a straight line at t = 0, x = 0, velocity is 9 ms^{-1}. The graph shows the variation of acceleration (a) with time (t) of a moving particle, then



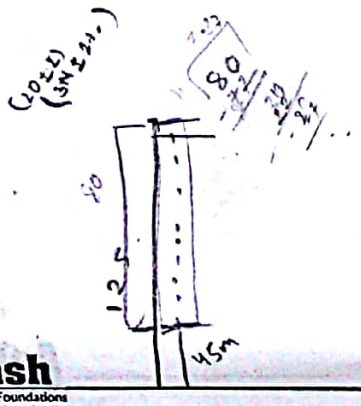
(1) Its velocity can become zero

(2) Its velocity can never become zero

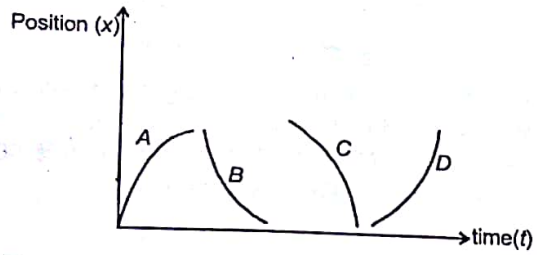
(3) Minimum velocity possible is 5 ms^{-1}

(4) Minimum velocity possible is 6 ms^{-1}

Space for Rough Work



23. Position-time ($x - t$) graph of four different bodies A, B, C and D during different time intervals are as shown.



The correct option is

(1) For body A, acceleration is positive

(2) For body B, acceleration is negative

(3) For body C, acceleration is negative

(4) For body D, acceleration is negative

24. A body moving in straight line with uniform acceleration crosses at two points A and B with velocities 30 m/s and 60 m/s respectively. The speed of the body when it crosses one third of the distance between A and B after crossing from A is

(1) $30\sqrt{2}$ m/s

(2) $20\sqrt{2}$ m/s

(3) $40\sqrt{2}$ m/s

(4) $25\sqrt{2}$ m/s

25. A motor vehicle left the point A and reached the point B by travelling in a straight line for 2 hours. The vehicle travelled half of the distance at a speed of v_1 = 40 km/h and other half at a speed of v_2 = 60 km/h. The distance between A and B is

(1) 86 km (2) 96 km

(3) 76 km (4) 106 km

26. If a particle accelerates with the acceleration $a = \frac{3v}{x}$, where v is velocity, x is a position and initial velocity is u at $t = 0$, $x = x_0$, then velocity and position are related as

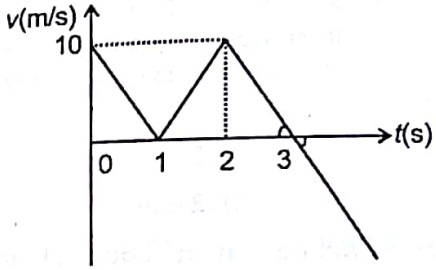
(1) $v = u + e^{x/x_0}$

(2) $v = u + \log_e(x/x_0)$

(3) $v = e^{-2x/x_0}$

(4) $v = u + 3\log_e|x/x_0|$

27. Figure below shows the velocity-time (v-t) graph of a particle moving along a straight line. After what time the particle acquires zero displacement?



(1) $(3+\sqrt{11})$s (2) $(3+\sqrt{8})$s

(3) $(3+\sqrt{3})$s (4) 6 s

28. Which of the following relations is correct? [AU is astronomical unit]

(1) 1 AU = 3.26 light year

(2) 1 light year = 1.496×10^{11} m

(3) 1 parsec = 3.084×10^{15} m

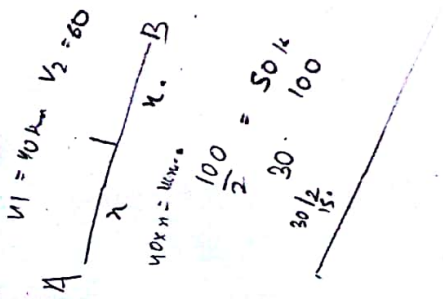
(4) 1 light year = 6.32×10^4 AU

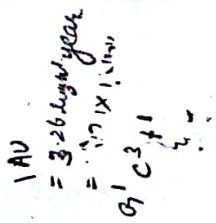
29. If universal gravitational constant (G), speed of light (c), and time (t) are base units then the dimensional formula of mass can be represented as

(1) $[G^1c^3t^1]$ (2) $[G^{-1}c^3t^1]$

(3) $[G^{-1}c^{-2}t^{-1}]$ (4) $[G^1c^{-3}t^{-1}]$

Space for Rough Work





30. While measuring the time of fall of a body from a height, a person makes an error of 2% in the value of acceleration due to gravity and an error of 4% in the value of height. The percentage error in the measurement of time of fall is

(1) Zero (2) 1%

(3) 6% (4) 3%

31. If the true value of time is 12:30:16 O'clock and two watches *A* and *B* show the time as written below. Select the single option in which watch *A* is most accurate and watch *B* is most precise

(1) *A*(12:30:10), *B*(12:30:16)

(2) *B*(12:30:17), *A*(12:30:16)

(3) *A*(12:30:16), *B*(12:30)

(4) *B*(12:30:16), *A*(12:30:12)

32. The radius of an arc having length 1 astronomical unit (AU) which subtends an angle of 2 seconds is

(1) 1.63 light year (2) 3.26 light year

(3) 1 parsec (4) 1.2 light year

33. The value of $\frac{1\text{ fermi}\times 1\text{ angstrom}}{1\text{ micron}\times 1\text{ giga metre}}$ is

(1) 10^{-31} (2) 10^{-10}

(3) 10^{-28} (4) 10^{-25}

34. In the relation $z=\frac{xe^2+y\sin\theta}{x+y}$, where e is exponential function, x and y are dimensional physical quantities, then the correct option is

(1) The dimensions of x and y are not same

(2) z is dimensionless

(3) The dimensions of z and y are same

(4) The dimensions of z and x are same

35. A juggler maintains four balls in the air with throwing speed 40 m/s upward in regular time intervals. When one ball is about to leave his hand the height of balls in air from the ground will be

(1) 60 m, 80 m, 60 m, 0 m

(2) 30 m, 40 m, 30 m, 0 m

(3) 15 m, 20 m, 15 m, 0 m

(4) 10 m, 20 m, 10.m, 0 m

36. The particle is moving with uniform acceleration along a straight line. The velocity of a particle at an instant is 20 m/s. After 4 s, its velocity will become 27 m/s. The velocity at 3 s before the given instant, is

(1) 14.75 m/s

(2) 16.5 m/s

(3) Zero

(4) 7 m/s

37. A car starts moving with acceleration 4 ms^{-2}. A bus 100 m behind the car starts simultaneously towards the car at $20\sqrt{2}$ m/s with uniform velocity. Which of the following is correct?

(1) Bus will overtake at $6\sqrt{2}$ s

(2) Bus will overtake at $3\sqrt{2}$ s

(3) Bus will overtake at $4\sqrt{2}$ s

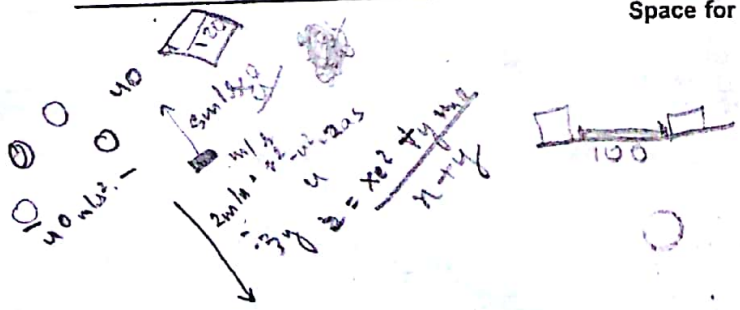
(4) Bus cannot overtake the car

38. A lift is coming down with a downward acceleration of 2 m/s^2. A boy standing in the lift throws a stone vertically upwards with speed 5 m/s w.r.t himself. The time after which he will catch the stone is

(1) 2.5 s (2) 1.25 s

(3) 3.75 s (4) 0.25 s

Space for Rough Work



39. The acceleration-time relation of a particle moving in a straight line is given $a = (-t^2 + 2t)$ m/s^2. The change in velocity from $t = 0$ to $t = 1$ s is

(1) $\frac{1}{3}$m/s

(2) $\frac{3}{3}$m/s

(3) $\frac{4}{3}$m/s

(4) $\frac{2}{3}$m/s

40. If a body loses half of its initial velocity on penetrating 2 cm in a wooden block, then how much it penetrate more before its velocity reduces to one fourth of its initial velocity. [Assume retardation of body is uniform]

(1) 2 cm

(2) 1 cm

(3) 0.5 cm

(4) 4 cm

41. *A*, *B*, *C* and *D* are points in a vertical line such that distances are in the ratio $AB : BC : CD :: 1 : 2 : 3$. If a body falls from rest from *A*, then times of descend through *AB*, *BC* and *CD* respectively are in the ratio

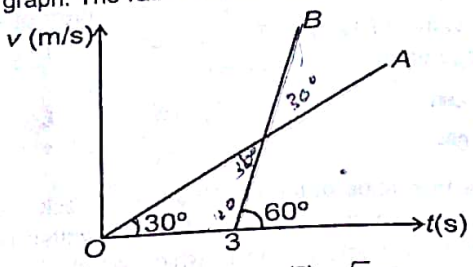
(1) $1:\sqrt{3}-1:\sqrt{6}-\sqrt{3}$

(2) $1:\sqrt{2}:\sqrt{3}$

(3) $1:\sqrt{2}-1:\sqrt{3}-\sqrt{2}$

(4) $1:\sqrt{3}-\sqrt{2}:\sqrt{5}-\sqrt{4}$

42. Two bodies *A* and *B* are moving on a same straight line with velocity-time (*v*-*t*) relation as shown in the graph. The ratio of accelerations of *A* and *B* is



(1) $1:\sqrt{3}$ (2) $\sqrt{3}:2$

(3) 1 : 3 (4) 3 : 2

43. A ball is dropped onto a floor from a height 20 m. It rebounds to a height of 5 m. If the ball is in contact with the floor for 6 millisecond time, the magnitude of average acceleration during that contact is

(1) 5000 m/s^2 (2) $\frac{5000}{3}$ m/s^2

(3) 5 m/s^2 (4) $\frac{5}{3}$ m/s^2

44. When *x*, *v*, *t* represent position, velocity and time then $\frac{d^2x}{dt^2}, \frac{dv}{dt}, \frac{d|v|}{dt}, \left(\left|\frac{dx}{dt}\right|\right)^2$ respectively represents

(1) Acceleration, rate of change in speed, rate of change in velocity, square of speed

(2) Velocity, acceleration, acceleration, acceleration

(3) Acceleration, acceleration, acceleration, acceleration

(4) Acceleration, rate of change in velocity, rate of change in speed, square of speed

45. When a particle is thrown vertically upwards, its velocity at one fourth of its maximum height is $10\sqrt{5}$ m/s. The maximum height attained by it is

(1) 33.3 m (2) 25 m

(3) 50 m (4) 44.4 m

Space for Rough Work

[CHEMISTRY]

46. If N_A is the Avogadro's number then number of valence electrons in 4.8 g of O^{-2} is
(1) 2.4 N_A (2) 4.2 N_A
(3) 1.6 N_A (4) 3.2 N_A

47. Which of the following has highest number of atoms? (Atomic mass of Ag = 108 u)
(1) 2 g of butane (C_4H_{10}) (2) 2 g of nitrogen
(3) 2 g of silver (4) 2 g of water

48. Choose the **incorrect** match regarding equivalent weight

Acid	Equivalent wt.
(1) H_3PO_2	M
(2) H_3PO_4	M/3
(3) H_3BO_3	M/3
(4) H_2SO_4	M/2

49. For the reaction A + 2B → 2C, 5 moles of A and 8 moles of B are reacted, then
(1) Whole 'A' is consumed
(2) Whole 'B' is consumed
(3) 8 moles of 'C' are obtained
(4) Both (2) & (3)

50. Volume of 2.8 g nitrogen at STP is
(1) 1140 cc (2) 1120 cc
(3) 22400 cc (4) 2240 cc

51. When 800 g of a 20% solution by weight was cooled, 100 g of solute precipitated. The percentage concentration of remaining solution is
(1) 8.57% (2) 15%
(3) 12.25% (4) 9.5%

52. 16 g oxygen has same number of molecules as in
(1) 22 g CO_2
(2) 64 g SO_2
(3) 46 g NO_2
(4) 28 g CO

53. The density of oxygen is 2.858 g/L. Volume occupied by 1 mol of oxygen is
(1) 22.4 L
(2) 11.2 L
(3) 33.6 L
(4) 5.6 L

54. The percentage of C by mass in urea (NH_2CONH_2) is about
(1) 20% (2) 40%
(3) 46.6% (4) 59.1%

55. Which of the following properties of solution does not vary with dilution?
(1) Normality
(2) Molarity
(3) Number of moles of solute
(4) Mole fraction of solute

56. The molarity of $NaNO_3$ solution is 1M. The density of solution is 1.20 g/mL. Molality of same solution is (mol.mass of $NaNO_3$ = 85 g/mol)
(1) 0.24 m (2) 3 m
(3) 0.89 m (4) 0.1 m

57. How many significant figures are present in 7.46×10^2?
(1) 8 (2) 3
(3) 4 (4) 5

Space for Rough Work

7.46×10^2
$= 746$

58. According to Avogadro's law, under similar conditions
(1) Equal volume of all gases contain equal number of atoms
(2) Equal volume of all gases contain equal number of molecules
(3) Equal volume of all gases contain equal number of g-atoms
(4) Equal volume of all gases contain unequal number of g-molecules

59. If N_A is Avogadro's number, then 20 amu will be equal to (in gram)
(1) $10\ N_A$ (2) $\frac{N_A}{10}$
(3) $\frac{20}{N_A}$ (4) $\frac{N_A}{20}$

60. 6 g of a hydrocarbon on combustion with 22.4 g of oxygen produces 17.6 g CO_2 and 10.8 g H_2O.
The data illustrates
(1) Law of conservation of mass
(2) Law of constant proportions
(3) Law of multiple proportions
(4) Law of reciprocal proportions

61. Which of the following solution has normality equal to molarity?
(1) H_2SO_4 (1M) (2) H_3PO_4 (1M)
(3) HNO_3 (1M) (4) $Mg(OH)_2$(1M)

62. The density of a liquid is 2.4 g/mL. There are 70 drops in 4 mL. The number of molecules in 1 drop is [Mol.wt. of liquid = 70]
(1) $\left(\frac{2.4}{70}\right)N_A$ (2) $\left(\frac{1}{35}\right)^2 N_A$
(3) $\frac{9.6}{(70)^2}N_A$ (4) $12N_A$

63. Two samples of $Ca_3(PO_4)_2$ and H_3PO_3 contain same number of 'P' atoms. The ratio of oxygen atoms in these samples is
(1) $\frac{8}{3}$ (2) $\frac{2}{3}$
(3) 3 (4) $\frac{4}{3}$

64. Study the following table

Compound	Mass of compound (in gm) taken
a. CO_2	8.8
b. NO_2	4.6
c. H_2O_2	13.6
d. SO_2	6.4

Which two compounds have same moles of oxygen atoms?
(1) b and d (2) a and c
(3) a and b (4) c and d

65. The number of oxygen atoms required to combine with 14 g of nitrogen to form N_2O_3 when 80% of nitrogen is converted into N_2O_3 is
(1) 3.6×10^{23} (2) 1.8×10^{23}
(3) 5.4×10^{21} (4) 7.2×10^{23}

66. 5 calories is equal to
(1) 20.925 J (2) 10.925 J
(3) 5 J (4) 1 J

67. Equivalent weight of metal oxide can be expressed as
(1) $E_{MO} = E_M + 16$
(2) $E_{MO} = E_M + 8$
(3) $E_{MO} = E_M + 32$
(4) $E_{MO} = E_M + 64$

Space for Rough Work

68. Which of the following is heterogeneous mixture?
(1) NaCl in H_2O
(2) Sugar in H_2O
(3) Soil in H_2O
(4) HCl in H_2O

69. The reciprocal of Avogadro's number
(1) Is equal to 1 amu
(2) Is known as AVOGRAM
(3) Is equal to 1 GAW
(4) Both (1) & (2)

70. Pure water obtained from river, sea, well etc. always contains hydrogen & oxygen combined together in the ratio of 1 : 8 by mass. It represents
(1) Law of constant proportions
(2) Law of multiple proportions
(3) Law of conservation of mass
(4) Gay-Lussac's law

71. What is the empirical formula of the compound which has the following percentage composition C = 80%, H = 20%?
(1) C_2H_5 (2) CH_4
(3) CH_3 (4) C_3H_8

72. How many moles of methane are required to produce 2.2 g CO_2 after combustion?
(1) 1.6 (2) 4
(3) 0.05 (4) 0.4

73. Molecular weight = vapour density × 2 is valid for
(1) Metals (2) Liquids
(3) Solids (4) Gases

74. According to Dulong and Petit's law, which of the following is **correct**?
(1) Molecular mass × specific heat = 6.4
(2) Atomic mass × specific heat = 6.4
(3) Equivalent mass × specific heat = 6.4
(4) Atomic mass + specific heat = 6.4

75. The atomic mass of Cu is 63.546. There are only two naturally occurring isotopes of copper Cu^{63} and Cu^{65}. The natural abundance of Cu^{63} isotope is approximately
(1) 20% (2) 72.7%
(3) 80% (4) 30%

76. An organic compound contains 10 atoms of carbon per molecule and contains 80% carbon by mass. The molecular mass of the organic compound is approximately
(1) 465 (2) 365
(3) 415 (4) 150

77. Sulphur trioxide is prepared by the following two reactions

$$S_{8(s)} + 8O_{2(g)} \longrightarrow 8SO_2(g)$$
$$2SO_{2(g)} + O_{2(g)} \longrightarrow 2SO_3(g)$$

How many grams of SO_3 are produced from 2 moles of S_8?
(1) 1280 g (2) 640 g
(3) 960 g (4) 320 g

78. An electric discharge is passed through a mixture containing 50 cc of O_2, 50 cc of H_2. Volume of the gas remained at room temperature will be (All measurements are made at room temperature)
(1) 75 cc (2) 50 cc
(3) 25 cc (4) 65 cc

Space for Rough Work

79. Equivalent weight of $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ is (Molar mass = M)

(1) $\frac{M}{4}$ (2) $\frac{M}{8}$

(3) $\frac{M}{6}$ (4) $\frac{M}{10}$

80. On heating potassium perchlorate (M.M. = 138.5 u) ($KClO_4$), the percentage loss in weight will be

(1) 23% (2) 40%

(3) 46% (4) 26%

81. A sample of $CaCO_3$ (50% purity) reacts completely with 0.1 M, 500 ml HCl solution. Weight of $CaCO_3$ sample is

(1) 2.5 g (2) 5 g

(3) 7.5 g (4) 10 g

82. 20 ml alkyne (C_2H_2) is hydrogenated by 40 ml of hydrogen gas to form alkane (C_2H_6). After the experiment, 40% alkyne remains unreacted. Total volume of reaction mixture shall be (all the measurements are made at room temperature)

(1) 20 ml (2) 28 ml

(3) 24 ml (4) 36 ml

83. 2.4 g metal displaces 0.56 L H_2 at NTP, then what would be the equivalent weight of metal?

(1) 96 (2) 48

(3) 24 (4) 12

84. In the metal oxide, metal is 53%, then equivalent weight of metal is

(1) 13 (2) 6

(3) 9 (4) 54

85. 27.6 g K_2CO_3 was treated by a series of reagents so as to convert all of its carbon to $K_2Zn_3[Fe(CN)_6]_2$. The weight of product is

[Mol. mass of K_2CO_3 = 138, Mol. mass of $K_2Zn_3[Fe(CN)_6]_2$ = 698]

(1) 22.3 g (2) 11.6 g

(3) 50.3 g (4) 112 g

86. The density in g/mL of a 4 M sulphuric acid solution which is 29% H_2SO_4 by mass will be

(1) 1.55 (2) 1.64

(3) 1.22 (4) 1.35

87. 15 mL of a solution of barium hydroxide on titration with 0.1 molar solution of HCl gave a titre value of 25 mL (vol. of HCl used). The molarity of $Ba(OH)_2$ will be

(1) 0.05 (2) 0.04

(3) 0.08 (4) 0.02

88. A 0.5 molal aqueous solution of sucrose contains 'a' mole fraction of solute. Value of 'a' is

(1) 0.90 (2) 0.09

(3) 0.009 (4) 0.99

89. 500 mL of 0.2 M $AlCl_3$ is mixed with 500 mL of 0.2 M $MgCl_2$ solution. Molarity of Cl^- in final solution is

(1) $\frac{M}{2}$ (2) $\frac{M}{4}$

(3) $\frac{M}{8}$ (4) M

90. For the reaction $CaO + 2HCl \longrightarrow CaCl_2 + H_2O$, 2.46 g of CaO is reacted with excess of HCl and 3.7 g $CaCl_2$ is formed. What is percentage yield $\left[\% \text{ yield} = \frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100\right]$?

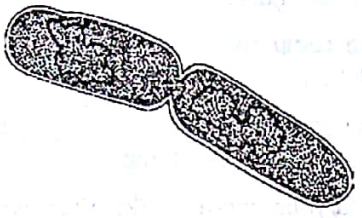
(1) 86% (2) 26%

(3) 76% (4) 16%

Space for Rough Work

[BIOLOGY]

91. Consider the given figure and find out the **correct** option:



a. Primitive type of DNA transfer from one bacterium to the other.

b. Cell division does not involve the spindle formation.

c. Specialised intercellular connection between F^+ and F^- cells.

d. Binary fission in unicellular eukaryotes.

(1) b & d are correct

(2) All are correct, except a

(3) Only b is correct

(4) c & d are correct

92. Defining features present in all living beings are

(1) Growth, Reproduction

(2) Metabolism, Internal growth

(3) Reproduction, Consciousness

(4) Cell division, Reproduction

93. Choose the **odd** one w.r.t. basis of modern taxonomic studies.

(1) Anatomy, Cell structure

(2) Ecology, Ontogeny

(3) Phylogeny, Genetics

(4) Morphology, Anatomy

94. Read the following statements w.r.t binomial nomenclature system.

A. It was developed by Linnaeus

B. Name of the author is written after specific epithet in abbreviated form

C. The first word denoting specific epithet starts with a capital letter

D. Biological names are generally in Latin and written in italics.

Correct statements are:

(1) A, B & D

(2) A, C & D

(3) B, C & D

(4) Only A & B

95. Ca^{2+}-dipicolinic acid-peptidoglycan complex is found in

(1) Cell wall of *Bacillus*

(2) Core wall and cortex of endospores in bacteria

(3) Spores developed in optimum temperature and moisture

(4) Perennating spores of *Clostridium*

96. Mark the **incorrect** match w.r.t taxonomic categories of mango.

(1) Phylum – Angiospermae

(2) Order – Sapindales

(3) Family – Anacardiaceae

(4) Genus – *Mangifera*

Space for Rough Work

97. a. Number of common characteristic increases from kingdom to species in taxonomic hierachy
b. Order being a higher category exhibit many similar characters.

Choose the **correct** option.

(1) Both a & b are correct
(2) Only b is correct
(3) Only a is correct
(4) Both a & b are incorrect

98. Match column I (pair of organisms) with column II (number of shared categories) and select the **correct** option.

Column I	Column II
(a) *Triticum, Mangifera*	(i) 5
(b) *Homo, Panthera*	(ii) 4
(c) *Solanum, Datura*	(iii) 2
(d) *Felis, Canis*	(iv) 3

(1) a(ii), b(iii), c(iv), d(i) (2) a(iii), b(iv), c(i), d(ii)
(3) a(iv), b(i), c(ii), d(iii) (4) a(i), b(ii), c(iii), d(iv)

99. All given characters are correct for *Mycoplasma*, **except**

(1) Smallest living prokaryotes
(2) Highly pleomorphic
(3) Non-motile
(4) Sensitive to penicillin

100. Which of the following pair is **wrongly** matched?

(1) ICBN – *Rhizopus*
(2) ICVCN – Virus
(3) ICNB – *Solanum*
(4) ICZN – *Panthera*

101. During the process of transformation

(1) A competent recipient dead cell and O_2 is required
(2) Donor and recipient cells do not come in contact
(3) Viruses multiply within the bacteria
(4) The recipient cell picks up ssDNA from the solution

102. In six kingdom classification _____ organisms are placed in _____ kingdoms.

(1) Eukaryotic, three (2) Prokaryotic, three
(3) Eukaryotic, five (4) Prokaryotic, two

103. Which of the following organism is capable of switching over to anaerobic mode to get energy for their survival?

(1) *Chlorobium* (2) *Clostridium*
(3) PPLO (4) Both (2) & (3)

104. Mark the **incorrect** option w.r.t monerans.

(1) Non-cellulosic cell wall
(2) Lack of nuclear membrane
(3) Cellular type body organisation
(4) Very simple in behaviour

105. Bacteria and protozoans were kept in the same kingdom by

(1) Haeckel (2) Copeland
(3) Whittaker (4) Linnaeus

106. **Statement A :** Most bacteria are decomposers.

Statement B : Membrane bounded cell organelles are absent in bacteria.

(1) Both statements A and B are correct
(2) Both statements A and B are incorrect
(3) Only statement A is correct
(4) Only statement B is correct

Space for Rough Work

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(d) *Felis, Canis*	(iv) 3

(1) a(ii), b(iii), c(iv), d(i) (2) a(iii), b(iv), c(i), d(ii)

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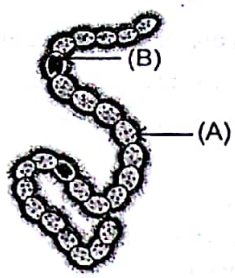
(4) Only statement B is correct

Space for Rough Work

107. Mark the **correct** option w.r.t given diagram.



(1) A – Cells with chlorophyll a and b
B – Cells with nitrogenase activity
(2) A – Cells with nitrogenase activity
B – Cells with chlorophyll a
(3) A – Cells with chlorophyll a
B – Cells with nitrogenase enzyme
(4) A – Cells perform CO_2 and N_2 fixation
B – Cells perform N_2 fixation

108. Pick up the **wrong** statement.
(1) Maximum nutritional diversity is found in the group, monera
(2) Two plants can be conclusively said to belong to the same species if they can reproduce freely with each other & form seeds
(3) The guts of cows and buffalo possess methanogens
(4) Nuclear membrane is present in kingdom monera

109. A : Cellular body organisation with autotrophic or heterotrophic mode of nutrition.
B : Loose tissue body organisation showing saprophytic or parasitic mode of nutrition.
Mark the **correct** option for A and B w.r.t five kingdoms classification.

	A	B
(1)	Protista	Animalia
(2)	Plantae	Fungi
(3)	Fungi	Monera
(4)	Monera	Fungi

110. Prokaryotes capable of converting CO_2 into methane is
(1) *Methanococcus*, an obligate aerobe
(2) *Methanobacterium*, a facultative aerobe
(3) *Methanobacterium*, an obligate anaerobe
(4) *Methanococcus*, a facultative anaerobe

111. Select the **incorrect** match.
(1) Cholera – *Vibrio*
(2) Diphtheria – *Mycobacterium*
(3) Tetanus – *Clostridium*
(4) Typhoid – *Salmonella*

112. Mark the **correct** statement.
(1) *Mycoplasma* species are mostly saprobic.
(2) *Nitrosomonas* species are chemoautotrophic.
(3) *Spirilla* are the most common bacteria.
(4) Tetanus, citrus canker and polio are known diseases caused by different bacteria.

113. In two kingdom classification system
(1) Unicellular and multicellular organisms were placed in separate groups
(2) Bacteria, blue green algae, mosses, ferns, gymnosperms and the angiosperms were placed under kingdom Plantae
(3) *Chlamydomonas* and *Spirogyra* were placed in separate groups
(4) Green algae and fungi were placed in different groups

114. Cytoplasm of the eubacterial cell
(1) Has 70S ribosomes
(2) Has sap vacuoles
(3) Shows cytoplasmic streaming movements
(4) Always lack gas vacuoles

Space for Rough Work

115. Chemosynthetic autotrophic bacteria
(1) Are the most abundant kind of bacteria
(2) Liberate oxygen in their surroundings
(3) Reduce organic compounds to CO_2 and H_2O
(4) Are important in recycling of mineral nutrients

116. Which of the following characters are **not** associated with blue green algae?
a. Red sea
b. Flagellation
c. Heterocyst
d. Eubacteria
e. Algal blooms
(1) b & d (2) a & b
(3) Only b (4) b, c & e

117. Which one of the following organisms are not examples of eukaryotic cells?
(1) *Chlorella vulgaris* and *Chlamydomonas nivalis*
(2) *Anabaena azolla* and *Paramoecium caudatum*
(3) *Spirogyra maxima* and *Nostoc commune*
(4) *Vibrio cholerae* and *Anabaena azolla*

118. Organisms showing simple structure and most diverse metabolism belong to kingdom
(1) Animalia (2) Plantae
(3) Fungi (4) Monera

119. Taxonomical aid used for storing, preservation and exhibition of plants and animals is
(1) Botanical garden
(2) Museum
(3) Key
(4) Flora

120. In earliest attempts of biological classification, Aristotle
(1) Classified animals into 4 sub-groups
(2) Proposed 2 kingdom classification
(3) Classified plants on the basis of habit
(4) Classified animals on the basis of body organisation

121. Besides cell wall, plants and animals in 2 kingdom classification were separated also on the basis of
(1) Excretion
(2) Mode of nutrition
(3) Locomotion
(4) Both (2) & (3)

122. Mark the **correct** option (w.r.t common method of reproduction in bacteria).
a. Sporulation
b. Binary fission
c. Fusion of gametes
d. Amitotic division
e. Cairn's θ model
f. Meiosis
(1) a, d & e (2) b, d & e
(3) Only b & d (4) b, c & f

123. Photosynthetic monerans
a. Are not most abundant bacteria
b. Are helpful in making curd
c. Not always have chlorophyll-a
d. Always motile
Choose the set of **correct** statements.
(1) a, d (2) a, c
(3) a, c, d (4) b, d

Space for Rough Work

124. Select the **incorrect** option (w.r.t Monera).

(1) Microbes are sole members of this kingdom

(2) Occur almost everywhere

(3) Incipient nucleus

(4) Motile or non-motile

125. Carl Woese found that the six kingdoms naturally cluster into three main categories based on

(1) Nutrition

(2) Gene sequencing

(3) Locomotion

(4) Presence or absence of cell wall

126. Cyanobacteria differ from archaebacteria in absence of

(1) 80S ribosomes

(2) Non-cellulosic cell wall

(3) Introns in the genetic sequence

(4) Sap vacuoles

127. Which of the following option represents **correctly** matched combination?

(1) *Acetobacter* – Vinegar - Archaebacterium

(2) *Halobacterium* – Salt loving - Eubacterium

(3) *Frankia* – N_2 fixation - Archaebacterium

(4) *Streptomyces* – Antibiotics - Eubacterium

128. *Nostoc* and *Anabaena* are characterised by ability to do

(1) Atmospheric nitrogen fixation in both heterocysts and vegetative cells, equally

(2) Either chemosynthesis or N_2 fixation at a time

(3) CO_2 fixation in presence of chlorophylls and phycobilins

(4) N_2 fixation and anoxygenic photosynthesis

129. Consider the following features regarding taxonomic aids and select the **correct** option.

a. Taxonomic keys serve as quick referral system in taxonomical studies.

b. Separate taxonomic keys are required for each taxonomic category.

c. Identification of organisms requires intensive laboratory & field studies.

d. Botanical gardens have plant and animal species, which are labelled to indicate its scientific name & its family.

(1) a, b & d are correct

(2) b, c & d are correct

(3) a & d are incorrect

(4) b & c are incorrect

130. Taxonomical aid that contains information of any one taxon is

(1) Manual

(2) Flora

(3) Monograph

(4) Catalogue

131. *Chlorella, Anabaena, Nitrococcus, Thiobacillus, Paramoecium, Amoeba, Halobacterium, Methanococcus*

The number of autotrophic and heterotrophic organisms are respectively

(1) 3, 5

(2) 5, 3

(3) 4, 4

(4) 2, 6

Space for Rough Work

132. Read the statements (A-C) and select the **correct** option stating them as True (T) or False (F).

A. The word systematics is derived from the Greek word 'Systema'.

B. Systematics takes into account evolutionary relationships between organisms.

C. The modern classification is exclusively based on the exclusively 'Uses' of various organisms.

D. Identification is the first step of taxonomy.

	A	B	C	D
(1)	T	T	T	T
(2)	T	T	T	F
(3)	F	T	F	F
(4)	T	T	F	F

133. The number of kingdoms in 5 kingdom classification with only heterotrophic mode of nutrition is/are

(1) Three (2) Four

(3) One (4) Two

134. In majority of higher plants and animals, growth & reproduction are

(1) Mutually inclusive events

(2) Mutually exclusive events

(3) Synonymous to each other

(4) Both (1) & (3)

135. Which of the following statement is **correct** for the process of transduction in bacteria?

(1) Number of genes transferred depends upon the time for which the two bacterial cells remain joined together

(2) Discovered by Zinder and Lederberg in *Escherichia coli*

(3) A specialised intercellular connection bridge is developed between two bacterial cells

(4) Phage mediated transfer of genetic material from one bacterium to other

136. Protonephridia are the main excretory structures in

(1) Cnidarians (2) Aschelminthes

(3) Molluscs (4) Platyhelminthes

137. What is **true** about all sponges without exception?

(1) They are asymmetrical

(2) They have a mixed skeleton consisting of spicules and spongin fibres

(3) They possess a cavity in body, behaving as gastrovascular cavity

(4) They possess a water canal system operating in their body that ensures their feeding, excretion, reproduction, etc.

138. Which one of the following is a **matching** set of phylum and its three examples?

(1) Aschelminthes – *Ancylostoma, Echinus, Dracunculus*

(2) Annelida – *Nereis, Pheretima, Laccifer*

(3) Mollusca – *Dentalium, Pinctada, Aplysia*

(4) Echinodermata – *Ophiura, Sepia, Antedon*

139. Read the following statements

a. Nematocysts are characteristic of all the coelenterates and help in locomotion only

b. Arthropods is the largest phylum is terms of number of species.

c. Haemocyanin is the respiratory pigment of all arthropods.

d. *Nereis*, scorpion, cockroach and silver fish all are characterised by presence of solid, ventral nerve cord.

Select the option which includes **wrong** statements.

(1) a & b (2) a, b & c

(3) b & d (4) Only a & c

Space for Rough Work

140. In the life cycle of *Fasciola*, the larva that is characterised by cilia over its body, has a free living habit and penetrates into the body of secondary host

(1) Miracidium larva (2) Sporocyst larva
(3) Cercaria larva (4) Metacercaria larva

141. Given below are four matchings of an animal and its kind of respiratory organ.

a. *Locusta* – Book lung
b. *Apis* – Ctenidia
c. *Limulus* – Book gills
d. *Pheretima* – Skin

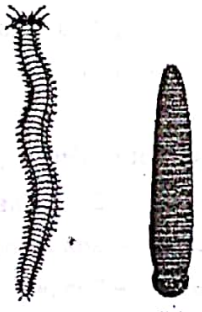
The **correct** matchings are

(1) a & d (2) b & c
(3) c & d (4) a & c

142. Which one of the following is the **true** description about an animal concerned?

(1) *Periplaneta* – Body divisible into cephalothorax and abdomen
(2) *Asterias* – Excretory system absent, larvae bilaterally symmetrical and coelomate animal
(3) *Euspongia* – Fresh water sponge, cellular level of organisation, and asymmetrical
(4) *Dentalium* – Presence of mantle and body divided into metameres

143. The figure shows two animals (a) & (b)



(a) (b)

Select the **correct** answer with respect to a common characteristic of these two animals.

(1) Both show dioecious condition
(2) Both have open vascular system
(3) Both have nephridia for excretion
(4) Both show indirect development

144. In which one of the following the genus name, its characters and its class / phylum are **correctly** matched.

	Genus Name	Characters	Class/ Phylum
(1)	*Pila*	Respiration through general body surface, hermaphroditism and direct life cycle	Mollusca
(2)	*Balanoglossus*	Coelomate, development involves larva	Hemichordata
(3)	*Aedes*	Chitinous exoskeleton 2 pair of wings and has direct development	Arthropoda
(4)	*Ancylostoma*	Triploblastic, free living round worm and female is longer than male	Aschelminthes

145. Which of the following worm belongs to platyhelminthes?

(1) *Wuchereria* (2) *Taenia*
(3) *Ascaris* (4) *Ancylostoma*

146. Which of the following is correct match of animals and its two feature?

	Animal	Feature
(1)	*Nereis*	True coelom, open type circulatory system present
(2)	*Fasciola*	Pseudocoelom, circulatory system absent
(3)	*Ascaris*	False coelom, closed type circulatory system present
(4)	*Balanoglossus*	Diocious, open type circulatory system present

Space for Rough Work

147. All of the following are endoparasites of human **except**?
(1) *Ancylostoma duodenale*
(2) *Hirudinaria*
(3) *Ascaris lumbricoides*
(4) *Taenia solium*

148. Mark the **correct** combination of the organism and its characteristics feature
(1) *Aplysia* – Mantle
(2) *Pinctada* – Radially symmetrical
(3) *Unio* – Asymmetrical
(4) *Dentalium* – Dorsal nerve cord

149. Which one of the following show metagenesis?
(1) *Spongilla* (2) *Physalia*
(3) *Adamsia* (4) *Dentalium*

150. In which one of the following sets of animals do all the four show indirect development?
(1) *Lepisma, Apis, Culex, Laccifer*
(2) *Saccoglossus, Ophiura, Nereis, Pila*
(3) *Fasciola, Sycon, Hirudinaria, Loligo*
(4) *Aplysia, Sepia, Chiton, Octopus*

151. Select the **correct** statement.
(1) All arthropod have tracheal system for respiration
(2) Radula is found in all echinoderms
(3) Echinoderms have an endoskeleton of calcareous ossicles
(4) Mostly echinoderms are monoecious

152. Select the organism which has undergone a long evolutionary period, but has not changed with time
(1) Scorpion (2) Lac-insect
(3) King-crab (4) Crab

153. Complete the following analogy:
Fasciola : Flame cells : : *Apis* : _____
(1) Green gland (2) Renette cell
(3) Malpighian tubule (4) Organ of Bojanus

154. Common characteristic of Millipede and centipede includes
(1) Have mantle
(2) Have unsegmented legs
(3) Both are non-poisonous
(4) Have trachea as respiratory structure

155. Metamerism is a feature exhibited by
(1) Tongue worms (2) Echinoderms
(3) Chordates (4) Roundworms

156. The characteristic feature that gives the name Parazoa to Porifera is
(1) Presence of porous body
(2) Presence of water transport system
(3) Presence of multicellular body without any tissue level organisation
(4) Presence of diploblastic body

157. One amongst the given options is an **odd** combination w.r.t. locomotory structure of given animals.
(1) Ciliated Comb plates – *Ctenoplana*
(2) Water vascular system – *Asterias*
(3) Parapodia – *Pheretima*
(4) Foot – *Pila*

158. Select the **incorrect** match
(1) *Meandrina* – Brain coral
(2) *Pleurobrachia* – Sea walnuts
(3) *Chaetopleura* – Sea pen
(4) *Gorgonia* – Sea fan

Space for Rough Work

159. Among *Hirudinaria*, *Pheretima*, *Ascaris*, *Ancylostoma*, *Trichinella*, *Wuchereria*, *Nereis*, how many of them possess both longitudinal and circular muscles which help in locomotion?

(1) One (2) Two

(3) Three (4) Four

160. Which one of the following sets of organism in option (1) to (4) are **correctly** categorised with one exception in it?

	Organism	Features	Exception
(1)	*Culex* *Locusta* Scorpion	Open circulatory system	Scorpion
(2)	*Aedes* *Apis* *Lepisma*	Chitinous exoskeleton	*Lepisma*
(3)	*Nereis* *Pheretima* *Hirudinaria*	Dioecious	*Nereis*
(4)	*Hydra* *Meandrina* *Antedon*	Marine water habitat	*Hydra*

161. Which of the following has both extracellular and intracellular digestion?

(1) *Leucosolenia* (2) *Cliona*

(3) *Planaria* (4) *Hydra*

162. Ctenophores are **not** characterised by

(1) Presence of eight external rows of ciliated comb plates.

(2) Property of bioluminescence.

(3) Exclusively marine life.

(4) Presence of specialised organ for excretion and osmoregulation.

163. Digestive system in tapeworm is

(1) Incomplete

(2) Complete

(3) Two-way digestive tract

(4) Absent

164. Protostomes differ from deuterostome in having

(1) Indeterminate cleavage

(2) Radial cleavage

(3) Spiral cleavage

(4) Blastopore during embryonic development form anus first

165. Read the following statements and choose the **correct** option.

Statement A : In *Obelia*, medusae produce polyps asexually or vice versa.

Statement B : *Fasciola* absorbs nutrients from host directly only through their body surface.

(1) A and B are correct

(2) A and B are incorrect

(3) Only A is correct

(4) Only B is correct

166. Some animals are given in box

Fasciola, Taenia, Hirudinaria, Wuchereria, Planaria, Ancylostoma

How many of them have true coelom and exhibits cross fertilisation?

(1) One (2) Two

(3) Three (4) Four

167. Porifera are said to have evolved from

(1) Trilobita (2) Rotifera

(3) Choanoflagellates (4) Protostomes

168. Mark the statement that is **incorrect** for *Anopheles*

(1) Metameric segmentation present

(2) Belongs to largest phylum in relation to number of species

(3) Bilateral symmetrical organism

(4) Have jointed appendages and chitinous endoskeleton

Space for Rough Work